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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/693,700	10/24/2003	Chester Ledlie Sandberg	5659-21000	2263

7590 09/15/2006

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EXAMINER

PAIK, SANG YEOP

ART UNIT	PAPER NUMBER
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3742

DATE MAILED: 09/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	Application No. 10/693,700	Applicant(s) SANDBERG ET AL.	
	Examiner Sang Y. Paik	Art Unit 3742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 May 2006.  
 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 466-469, 471-507 and 509-518 is/are pending in the application.  
 4a) Of the above claim(s) 472 is/are withdrawn from consideration.  
 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
 6) ☒ Claim(s) 466-469, 471, 473-507 and 509-518 is/are rejected.  
 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) ☐ All b) ☐ Some \* c) ☐ None of:  
 1. ☐ Certified copies of the priority documents have been received.  
 2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>216/26, 213/06, 1124/06</u> | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 U.S.C. § 103(a)*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

2. Claims 466-469, 473-492, 494-497, 499, 500-507 and 510-518 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP130671 in view of Pritchett (US 3,757,860).

EP130671 discloses a fluid electric heater (P. 17 and Fig. 4) comprising ferromagnetic materials configured such that the heater automatically reduces its heat output near or above a selected temperature (Curie temperature of the ferromagnetic material). The heater autoregulates its temperature about the Curie temperature via its intrinsic resistance. See abstract and P. 13, lines 3-14. The heater is connected to an AC source with a frequency of 50 Hz – 10 KHz. See P. 8, line 19-23. But, the claims differ from EP130671 in calling for configuring the heater to heat a subsurface formation.

Pritchett shows that heating subsurface formations with ferromagnetic electric heaters that utilize skin effect heating are well known in the art. Pritchett (US 3,757,860), for example, discloses a well heater comprising an AC generator 15 connected to ferromagnetic (steel) casings or pipes 11 and 4 to heat the casings as well as the surrounding subsurface formation by the intrinsic skin effect as electric current flows through the pipes' ferromagnetic material. Thus, the

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viscosity of liquid produced in the well (i.e., hydrocarbons) is reduced. See abstract, col. 3, lines 19-40, col. 5, line 63 – col. 6, line 61, and the figure. With such a ferromagnetic skin effect heater, the formation can be heated directly by merely connecting AC to a long metallic structure that is buried within the formation, such as a ferromagnetic pipe or casing. In view of Pritchett (US 3,757,860), it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the autoregulating ferromagnetic electric heater to heat subsurface hydrocarbon-producing formations to reduce the hydrocarbons' viscosity thereby enhancing recovery. Such an arrangement enables heating the formation by merely connecting AC to a long metallic structure that is buried within the formation, such as a ferromagnetic pipe or casing.

Regarding claims 466 and 485, the limitation that the selected temperature is “within about 50 °C of the Curie temperature of the ferromagnetic material” fully reads on EP130671 since the selected temperature disclosed in EP130671 (i.e., the Curie temperature) falls within the claimed range.

Regarding claims 467-469, the claimed power source frequencies are fully met by EP130671 who discloses connecting the heater to an AC source with a frequency of 50 Hz – 10 KHz. See P. 8, line 19-23.

Regarding claim 473, although current is applied to ferromagnetic well casings 11 and 4, the well casing itself is positioned in an opening comprising an uncased wellbore.

Regarding claim 474, EP130671 discloses a number of different iron-nickel alloys with varying Curie temperatures suitable as ferromagnetic materials for autoregulating electric

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heaters. See P. 14, Table I (noting that iron-nickel alloys have relatively lower Curie temperatures compared to other ferromagnetic materials).

Regarding claims 475 and 496, see P. 9, lines 24-26.

Regarding claims 476, 477, 482, 494, 499, 504, 514, and 517, no criticality is seen in the specific values of reduced heat above or near the selected temperature, turndown ratio, the conductor's resistance as a function of temperature, and heat output reduction in lieu of the autoregulating heater disclosed in the prior art. Moreover, the specific values claimed merely optimize result-effective variables well within the scope of routine experimentation by skilled artisans depending on the desired temperature and heat output.<sup>1</sup> It is well settled that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233,235 (CCPA 1955).

Regarding claim 478, see P. 6, lines 24-28.

Regarding claims 481, 503, and 516, although EP130671 discloses a 50-amp power source (P. 6, line 28), no criticality is seen in using at least 70 amps in lieu of 50 amps. As is well known in the art, increasing the electric current applied to an electric heater will increase the overall heat output. Thus, the specific current would be an engineering design choice well within the level of skilled artisans depending on the heat intensity desired. Moreover, Pritchett (US 3,757,860) teaches that AC is supplied to a skin effect heater at 250 amps. See col. 8, line 62 and col. 6, lines 45-48. In view of Pritchett (US 3,757,860), it would have been obvious to

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<sup>1</sup> Further evidence of such engineering design considerations can be found in *Recommended Practice for Electrical Impedance, Induction, and Skin Effect Heating of Pipelines and Vessels*, IEEE Std. 844-2000, Sect. 11.3.

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one of ordinary skill in the art at the time of the invention to provide a higher current power source to increase the electric heater's overall heat output.

Regarding claim 488, although EP130671 does not expressly state that the initial heat output is at least 50 °C below the Curie temperature, EP130671 nonetheless implies initially applying AC to an unheated conductor in P. 13, lines 3-8. This initial unheated state of the electric conductor (and subsequent heating to the Curie temperature) would reasonably suggest to the skilled artisan that the heater's initial heat output is at least 50 °C below the Curie temperature.

Regarding claim 500, because (1) the heater of EP130671 utilizes the skin effect of the conductor to ultimately dictate its heating, (2) the inverse relationship between frequency and skin depth is well known (see P. 2, lines 11-28), and (3) a wide frequency range of 50 Hz – 10 KHz is envisioned (see P. 8, line 19-23), the heater of EP130671 would inherently control the skin depth in the conductor by varying the applied frequency.

3. Claims 471 and 498 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP130671 in view of Pritchett as applied to claims above and, further in view of Vanegmond et al. (US 4,572,299).

The claims differ from the previously cited prior art in calling for heating the hydrocarbon material at or above a pyrolysis temperature. But heating subsurface hydrocarbon formations at or above pyrolysis temperatures is well known in the art as evidenced, for example, by Vanegmond et al. (US 4,572,299) in col. 1, line 39 – col. 2, line 7. As is well known in the art, heating formations at or above pyrolyzing temperatures to enable recovery of hydrocarbons

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from the formation. In view of Vanegmond et al. (US 4,572,299), it would have been obvious to one of ordinary skill in the art at the time of the invention to heat the formation at or above pyrolyzing temperatures to enable recovery of hydrocarbons from the formation.

4. Claim 509 is rejected under 35 U.S.C. 103(a) as being unpatentable over EP130671 in view of Pritchett (US 3,757,860) and further in view of Vanegmond et al. (US 4,572,299).

The claims differ from the previously cited prior art in calling for heating the hydrocarbon material at or above a pyrolysis temperature. But heating subsurface hydrocarbon formations at or above pyrolysis temperatures is well known in the art as evidenced, for example, by Vanegmond et al. (US 4,572,299) in col. 1, line 39 – col. 2, line 7. As is well known in the art, heating formations at or above pyrolyzing temperatures to enable recovery of hydrocarbons from the formation. In view of Vanegmond et al. (US 4,572,299), it would have been obvious to one of ordinary skill in the art at the time of the invention to heat the formation at or above pyrolyzing temperatures to enable recovery of hydrocarbons from the formation.

#### ***Double Patenting***

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686

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F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claims 466-469, 471 and 473-492, 494-507 and 509-518 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 268-408, 625, 659, 685, and 710 of copending Application No. 10/693,816 in view of EP130671.

The claims differ from the claims of the '700 application in calling for a AC power source with a frequency of 100 Hz – 1000 Hz. Powering ferromagnetic electric heaters with AC sources with such frequencies, however, is well known in the art. EP130671, for example, discloses a fluid electric heater (P. 17 and Fig. 4) comprising ferromagnetic materials configured such that the heater automatically reduces its heat output near or above a selected temperature (Curie temperature of the ferromagnetic material) such that it autoregulates its temperature about the Curie temperature via its intrinsic resistance. See abstract and P. 13, lines 3-14. The heater is connected to an AC source with a frequency of 50 Hz – 10 KHz. See P. 8, line 19-23. Such a wide frequency range enables the skin depth (and heating) to be precisely controlled in view of



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the well-known inverse relationship between frequency and skin depth. See P. 2, lines 11-28. In view of EP130671, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide an AC power source in the claimed frequency range in the apparatus claimed in the '816 application to precisely control the skin depth (and heating) by selecting an associated higher frequency.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

### ***Response to Arguments***

7. Applicant's arguments filed 5/15/06 have been fully considered but they are not persuasive.

The applicant argues there is no motivation to combine EP 130671 and the Pritchett reference since Pritchett shows the skin effect whereas EP130671 shows conducting current into other materials as the Curie temperature of the ferromagnetic material is approached. This argument is not deemed persuasive since EP 130671 teaches the skin effect having the auto-regulating heating temperature and does not teach away from the skin effect heating. Furthermore, EP 130671 teaches that its heating is used for heating fluids, air, gas water or other liquids, it would have been obvious to combine the Pritchett reference, to further show the use of the heater in the subsurface formation to heat gases or liquids including oils.

With respect to the claims, the applicant reiterates the original scope of the claims that the examiner has found to be either anticipated or obvious as stated in the grounds of rejection. The grounds of rejections are thus maintained and the applicant's arguments are found to be unpersuasive.

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With respect to the finality of the election requirement, the applicant argues that because of the use of the open ended transitional phrase “comprising”, the applicant is not limited to only a single ferromagnetic material and the restriction is improper. This is not persuasive since it is found that having an additional material including another ferromagnetic material and/or nonferromagnetic is found to be separately patentable and novel. Regardless of the open ended transitional phrase, if a patentably distinct species is disclosed, a restriction is proper.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sang Y. Paik whose telephone number is 571-272-4783. The examiner can normally be reached on M-F (9:00-4:00) First Friday Off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robin Evans can be reached on 571-272-4777. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Sang Y Paik  
Primary Examiner  
Art Unit 3742

syp